

REMARKS

Claims 1-8, 10, 12, 13, 22 and 25-29 are pending.

Claims 1-5, 8, 10, 12-13; 22 and 25-27 are rejected under 35 U.S.C. § 103 (a) as being obvious over Mehaffy et al. (EP 0934990A1, hereinafter “Mehaffy”). It seems to be the examiner's position that paragraph [0033] of Mehaffy discloses an adhesive that is applied at 200°F, wherein the heat stress value is separated by 90°F or less from the application temperature. Examiner notes that the adhesive can be applied at 200°F and that a bond formed by two pieces of corrugated case substrate held together by a 1/2" by 2" compressed beam can maintain a cantilever stress load of 2 to 2.5 psi for 24 hours at temperatures at or above 115°F (interpreted as heat stress value). The examiner further notes that Mehaffy discloses a hot melt adhesive that is substantially similar to the instant adhesive (paragraphs [0009-0018, 0029]). Hence, the examiner urges that it would have been obvious to a skilled artisan that Mehaffy's viscosity of the hot melt adhesive at 200°F is within the applicant's claimed range because Mehaffy's adhesive is substantially similar to the adhesive disclosed by the applicant.

Applicants disagree and noted that, in the response filed on September 8, 2009, Mehaffy fails to teach that an adhesive that can be applied at temperature below of about 250°F with a heat stress delta at or below 100°F. While Mehaffy teaches that the adhesive application temperature may be 200-300°F, the heat stress value is at or above 115°F (Mehaffy page 7, Table 1). The applicants have further stressed that a skilled artisan would realize that Mehaffy's adhesive would not have the viscosity range of from

about 800 to 1500 cPs application temperature below 250°F. The applicants have noted that it is well known in the art that for every increment of 25°F decrease of the application temperature, the viscosity of the hot melt adhesive increases about 40% (Reply to the Office Action dated September 8, 2009), page 7). In response, the Examiner has indicated that the Applicants have fails to show proof that the viscosity will increase such amounts.

According to "*Plastics Technology Handbook*, 4th Ed," Chanda, M. & Roy, S., CRC Press 2007, section 3.2.16.4, titled Effect of Temperature on Polymer Viscosity, the viscosity of most polymers changes with temperature and it can be described by the Arrhenius equation, shown below:

$$n = n_0 e^{(-E_a/T)}$$

where n = viscosity at T

n_0 = viscosity at T approaches 0K

E_a = activation energy

T = temperature in Kelvin

The relationship of the temperature and rate (of polymer viscosity) can then be expressed as:

$$\frac{n_{T1}}{n_0} = e^{(-E_a/T1)}$$
$$\frac{n_{T2}}{n_0} = e^{(-E_a/T2)}$$

$$\frac{n_{T1}}{n_{T2}} = \frac{e^{(-E_a/T1)}}{e^{(-E_a/T2)}}$$

$$(n_{T1}/n_{T2}) = e^{\wedge\{E_a(1/T_1 - 1/T_2)\}}$$

$$\ln(n_{T1}/n_{T2}) = \ln\{e^{\wedge\{E_a(1/T_1 - 1/T_2)\}}\}$$

$$\ln(n_{T1}/n_{T2}) = E_a(1/T_1 - 1/T_2)$$

To show that for every 25°F decrease in application temperature of Mehaffy's adhesive would result in about a 40% increase in viscosity, T_1 (250°F = 121 °C = 394K), T_2 (225°F = 107 °C = 380K), E_a (estimated as 4000K⁻¹ for general polymer) and n_{T1} (set as 1205 cP from Mehaffy's adhesive sample 1 from Table 1, page 7) were substituted in the above equation. The calculated Mehaffy's adhesive has a viscosity of about 1751 cPs at 225°F (see calculation below).

$$\ln(1205 \text{cP}/n_{T2}) = 4000 \text{ K}^{-1} (1/394\text{K} - 1/380\text{K})$$

$$n_{T2} = 1751 \text{ cPs}$$

Similar viscosity calculation was conducted for Mehaffy's adhesive Sample I at 200°F (93°C = 366K). The calculated viscosity was 2620 cPs at 200°F.

Based on the Arrhenius equation and Mehaffy's reported viscosity value at 250°F, a skilled artisan would not be led to believe the viscosity of Mehaffy's adhesive would be below about 1500 cPs at 250°F or lower (application temperature) with a heat stress delta of less than 100°F.

Accordingly, if Mehaffy's adhesives were to be applied at 225°F, the viscosity range would be greater than about 1600 cps. If Mehaffy's adhesive was applied at 200°F, as exemplified in the instant invention, the viscosity range would be greater than about 2600 cps. At these high viscosity values, a skilled artisan would be led away from utilizing such adhesive on hot melt adhesive equipment/machinery, for majority of commercially employed hot melt application equipment requires a viscosity of below about 1500 cps (instant specification at page 5, lines 15-17). Use of an adhesive with

higher viscosity would lead to stringing of the adhesive for the nozzles and improper amount or control of adhesive transfer to the substrate (page 5, lines 18-19). Hence, one skilled in the art would not look to Mehaffy to develop an adhesive that can be applied at temperature below 250°F.

In contrast to Mehaffy's adhesives, applicants' have shown that adhesives can be formulated that can maintain a temperature separation of 100°F or less between the application temperature and the adhesive heat stress value.

Withdrawal of the Section 103 rejections of the claims 1-5, 8, 10, 12-13-22 and 25-27 over the Mehaffy reference is requested.

Claims 6 and 7 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over Mehaffy in view of Baetzold et al. (U.S. 5,827,913, hereinafter "Baetzold"). It seems to be the examiner's position that Mehaffy discloses a hot melt adhesive as stated above, and further discloses that "other additives" can be added depending on the end use of the adhesive. The examiner acknowledges that Mehaffy is silent as to the additives as being a fragrance or an energy-absorbing ingredient.

The examiner cites Baetzold as disclosing a hot melt adhesive which can be used in packaging (column lines 10-12), and the presence of fragrances and energy absorbing ingredients is well known in the art (abstract, column 4, lines 17-31). Therefore, it is the examiner's position that at the time of the invention it would have been obvious to a person of ordinary skill in the art to add a fragrance and/or an energy-absorbing

ingredient to the hot melt adhesive of Mehaffy because the use of such ingredients is well known, as taught by Baetzold.

Applicants disagree.

The remarks made above regarding Mehaffy are equally applicable here. Baetzold is directed to encapsulating an ingredient in a hot melt adhesive composition. Baetzold teaches that the encapsulated ingredient may be any known hot melt adhesive formulation ingredient or additive such as antioxidants and fragrances (abstract). The disclosure of Baetzold adds nothing to the disclosure of Mehaffy which would motivate the skilled artisan to formulate an adhesive that can be applied at a temperature below 250°F and which are able to withstand stress at temperatures substantially closer to the temperature of the adhesive's application temperature than heretofore achieved in the art, i.e. the bonded adhesive heat stress value and the adhesive application temperature are separated by 100°F or less.

Withdrawal of the Section 103 rejection of claims 6 and 7 based on Mehaffy in view of Baetzold is requested.

Withdrawal of the rejections of record and notification of allowance is requested.

Respectfully submitted,
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